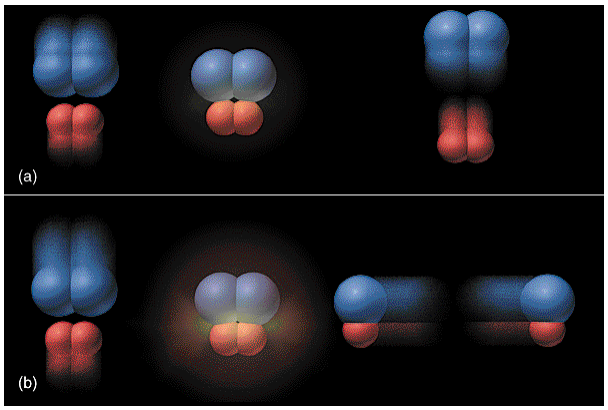
C-4.10 Explain the role of collision frequency, the energy of collisions, and the orientation of molecules in reaction rates. (additional content/depth)

Revised Taxonomy Levels 2.7 B <u>Explain</u> conceptual knowledge

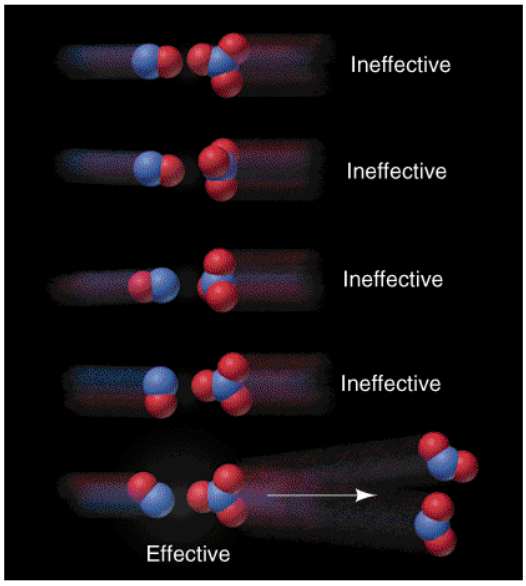
This concept was not addressed in physical science

It is essential for students to

- Understand that the more collisions among the particles in a sample of reacting substances, the greater the reaction rate.
  - Explain how various factors can influence collision frequency
- Understand that only collisions which occur between particles with enough energy to react result in the formation of products.
  - In diagram (a) the molecules do not have enough kinetic energy to react
  - In diagram (b) the molecules do have enough energy so the collision results in a reaction.



- Understand that only collisions which occur between particles in the correct orientation result in the particles reacting to form products.
  - In the diagram below, only the last illustration results in a chemical reaction.



Assessment

- The verb, explain means that the major focus of assessment should be for students to "construct a cause and effect model". In this case, assessments will ensure that students can model how collision frequency, collision energy and the orientation of molecules influence reaction rate. Because the indicator is written as conceptual knowledge, assessments should require that students understand the "interrelationships among the basic elements within a larger structure that enable them to function together." In this case, assessments must show that students can construct a cause and effect statement relating how each of these factors affect the rate of a chemical reaction in terms of kinetic theory.